{Please replace page 3, line 20 through page 6, line 26 of the description with the following:}

A first method aspect is a method of controlling a biological wastewater treatment process. It comprises conducting a biological process in at least one treatment tank containing wastewater and having associated therewith at least one device to supply an increasing and decreasing flow of oxygen-containing gas and/or wastewater into the tank. The process is one in which the need for oxygen repeatedly increases and decreases during the process. The process is supported at least in part by introducing the oxygen-containing gas into the wastewater in the form of bubbles provided in the wastewater by a gas supply system, and causing at least a portion of the oxygen in the bubbles to dissolve in the wastewater and at least a portion of the dissolved oxygen to be consumed by the biological process. The oxygen so dissolved may represent an excess or a deficiency relative to the oxygen consumed by the biological process. At least one gas collection member is positioned to receive offgas representing gas from said bubbles that has not been dissolved into the wastewater. Operation of the biological process is controlled with a control system that, as the process operates, exercises continuing control over the process at least partially in response to (1) offgas measurements that are taken by the control system from the offgas collected in the gas collection

member and that are correlative with changing amounts of one or more gases in the offgas, and (2) DO data correlative with varying DO levels in the wastewater and/or performance data correlative with varying ability of the gas supply system to transfer oxygen to the wastewater. Such measurements and data are used to provide, in the control system, control values, which may be components of control values, and which include (1) first control values, comprising requirements control values, that change in response to, while remaining correlative with, the need for oxygen in the process, and (2) second control values, comprising DO control values and/or performance control values that change in response to, while remaining correlative with, respectively, DO levels in the wastewater and/or the varying ability of the gas supply system to transfer oxygen to the wastewater. The first and second control values are used to derive, in the control system, control signals for adjusting the above-mentioned at least one device.

In an embodiment of the above method aspect, the control system exercises continuing control over the amount of gas discharged into the tank and repeatedly increases and decreases that amount, during the process, as the need for oxygen varies. Also, the control signals derived in the control system are based at least in part on offgas measurements, DO

data and performance data and are utilized to control the amount of gas discharged into the tank through the gas supply system.

A second method aspect of the invention involves exercising continuing control over an oxygen-consuming biological wastewater treatment process in which the need for oxygen repeatedly increases and decreases and which is conducted in at least one wastewater treatment plant processing tank. The method is conducted in cooperation with a gas supply system to supply oxygen-containing gas bubbles to, and dissolve oxygen in, the wastewater in the at least one plant processing tank and a control system. That system comprises at least one flow control element to supply an increasing and decreasing flow of oxygen-containing gas through the gas supply system into the wastewater in the at least one plant processing tank. At least one gas collection member and gas detector are employed to provide off-gas data correlative with changing amounts of one or more gases in offgas from the wastewater and a controller is used to process the offgas data and cause the flow control element to increase and decrease the flow of oxygen-containing gas into the wastewater in said tank or tanks.

According to this second aspect, the method comprises providing in the control system DO (dissolved oxygen) data correlative with varying DO

levels in the wastewater and/or performance data correlative with varying ability of the gas supply system to dissolve oxygen in the wastewater. Control values are generated in the control system derived at least in part from (a) the offgas data and (b) the DO data and/or performance data. Such control values are used to generate control signals to cause the at least one flow control element to cause varying flows of oxygen-containing gas through the gas supply system and into the at least one processing tank that are correlative with the varying consumption of oxygen by the biological process adjusted to (a) cause wastewater DO levels to move toward, return to or be maintained at a target value and/or (b) compensate for the varying ability of the gas supply system to dissolve oxygen in the wastewater.

In one of its embodiments, the second aspect comprises generating control values in the control system derived at least in part from the offgas data, DO data and performance data. Such values are used to generate control signals to cause the at least one flow control element to provide flows of oxygen-containing gas into the at least one plant processing tank. These flows reflect process oxygen needs adjusted to (a) cause wastewater DO levels to move toward, return to or be maintained at a target value and (b) compensate for the varying ability of the gas supply system to dissolve oxygen in the wastewater.

A third aspect of the invention involves a control system for controlling wastewater treatment apparatus. The apparatus comprises at least one tank to contain and treat wastewater in a biological process, at least one device to supply an increasing and decreasing flow of an oxygen-containing gas into the wastewater to support the process, a gas supply system to introduce the gas into the wastewater as bubbles and cause at least a portion of the oxygen in the bubbles to dissolve in the wastewater and be at least partly consumed by the process and at least one gas collection member positioned to receive offgas from the wastewater. The control system comprising the combination of (A) at least one gas detector that can take offgas measurements correlative with varying amounts of at least one gas collected in the gas collection member and (B) at least one DO (dissolved oxygen) detector that, when in contact with the wastewater in the tank, can take DO measurements of the DO levels of the wastewater. Also present in the control system is at least one controller which contains or has access to code which the controller can utilize with the offgas measurements and DO measurements to provide, in the control system, varying control values, which may be components of control values. These are (a) at least in part correlative with repeatedly fluctuating requirements for oxygen-containing gas flow to support the biological process and (b).at least in part correlative with such varying positive or negative adjustment of the oxygen-containing gas flow as may

be needed to cause the wastewater DO levels to move toward, return to or be maintained at a target value. The controller derives control signals, based at least in part on said control values, to which the at least one device is responsive.

In an embodiment of the control system of the third aspect, the at least one controller contains or has access to additional code which the controller can utilize with performance data to provide, in the control system, varying additional control values, which may be components of control values. These are correlative with the varying ability of the gas supply system to transfer oxygen to the wastewater, and the additional code is configured to apply the additional control values in combination with the first-mentioned control values in deriving the control signals

A fourth aspect of the invention involves apparatus for exercising continuing control over an oxygen-consuming biological wastewater treatment process in which the need for oxygen repeatedly increases and decreases and which is conducted in at least one wastewater treatment plant processing tank in cooperation with a gas supply system and a control system. The gas supply system supplies oxygen-containing gas bubbles to, and dissolve oxygen in, the wastewater in the at least one plant processing tank. The control system comprises at least one flow control

element to supply an increasing and decreasing flow of oxygen-containing gas through the gas supply system into the wastewater in the at least one plant processing tank, at least one gas collection member and gas detector to provide off-gas data correlative with changing amounts of one or more gases in offgas from the wastewater, and a controller to process the off-gas data and cause the flow control element to increase and decrease the flow of oxygen-containing gas into the wastewater in said tank or tanks.

The fourth aspect is characterized in that the apparatus comprises at least one DO (dissolved oxygen) detector to provide, in the control system, DO data reflecting DO levels in the wastewater and the controller contains or has access to code which, with the aid of the offgas data and DO data, the controller defines varying control values. These comprise separate or combined requirements control values correlative with the repeatedly fluctuating need for oxygen-containing gas flow to support the biological process and DO control values that are correlative with such varying positive or negative adjustments of oxygen-containing gas flow sufficient to cause the wastewater DO levels to move toward, return to or be maintained at a target value. The at least one flow control element is connected with the controller to receive and act in response to control signals in the control system based at least in part on said control values to supply an increasing and decreasing flow of oxygen-containing gas

through the gas supply system into the wastewater in the at least one plant processing tank.

The fourth aspect may be embodied in a form in which the controller contains or has access to code which, with the aid of performance data, the controller defines performance values that are correlative with additional oxygen-containing gas flow adjustments needed to compensate for varying ability of the gas supply system to dissolve oxygen in the wastewater.